CLAIMS

What is claimed:

1. An endoscope comprising:

a fiber optic waveguide that transmits an image from a distal end to a proximal end, the waveguide having an outer diameter of less than 3 mm;

a lens positioned at the distal end of the fiber optic waveguide;

an imaging device optically coupled to the proximal end of the fiber optic waveguide; and

a sheath extending about the fiber optic waveguide, the sheath including an illumination channel.

2. The endoscope of claim 1 wherein the lens comprises a first lens element, a second lens element and an aperture stop.

3. The endoscope of claim 1 wherein the lens couples light at any position on a distal surface of the lens to a plurality of optical fibers such that the numerical aperture of light entering each fiber from a position varies as a function of angle.

4. An endoscope comprising:

a fiber optic waveguide that transmits an image, the waveguide having a diameter of less than 2 millimeters;

an optical system coupled to a distal end of the waveguide;

a lens system optically coupled to a proximal end of the waveguide;

an imaging device that receives an image from the fiber optic waveguide; and

a disposable sheath extending over the optical waveguide.

5. The endoscope of claim 4 wherein the fiber optic waveguide is plurality of optical fiber.

6. The endoscope of claim 5 wherein the waveguide has at least 3000 imaging fibers.

7. The endoscope of claim 6 wherein the optical lens at the distal end of the waveguide is an achromatic lens system including an aperture stop.

8. The endoscope of claim 7 wherein the numerical aperture of the lens system is balanced to the imaging fibers.

9. The endoscope of claim 4 wherein the disposable sheath has a window over the distal end.

10. The endoscope of claim 4 wherein the disposable sheath has a lens at the distal end.

11. The endoscope of claim 4 wherein the optical system is non-telecentric and includes a first lens element, a second lens element and an aperture stop.

12. The endoscope of claim 4 wherein the disposable sheath transmits light to the distal end of the endoscope.

13. The endoscope of claim 4 further comprising an annular illumination channel encircling the optical waveguide fiber for transmitting the light and the sheath having a single sealed outer tube.

14. The endoscope of claim 6 wherein the disposable sheath has a tube for passing a tool to the distal end of the endoscope.

15. The endoscope of claim 4 further comprising a working channel.

16. The endoscope of claim 4 wherein the sheath comprises an illumination fiber optic system coupled to a light source through a handle.

17. The endoscope of claim 12 wherein an illumination fiber extending through the sheath is coupled to a light source with a connector.

18. The endoscope of claim 4 wherein the imaging device is connected to an image processor.